The Engineering News.

A Journal of Practical Science and Public Improvements.

PUBLISHED MONTHLY.

MAY 15th, 1875.

We would again urge upon those of our readers who have not yet renewed their subscriptions to do so at once. There are but a few of them, but we want *every one* of our past year's subscribers to remain with us. We will take it for granted, however, that those who do not renew by our next issue, wish to be dropped from our mail list, which will accordingly be done. At the same time we hope our friends will take the trouble to call the attention of their acquaintances in the profession, and those who are at all interested in the class of subjects of which we treat, to the Engineering News, and so assist us in doubling up our present list. We know that our paper will recommend itself, and being so very low in price, is readily taken wherever attention is called to it. One Engineer in Toronto, Ontario, although having hardly a moment to spare from his professional duties as engineer for the largest Land Company in the Dominion, has yet been able to send us twenty-five new subscribers within two months; two Assistant Engineers of the Boston Water Works, while in the discharge of their daily duties, have added a like number; the Register of the City of Philadelphia gratified us one day not long since with a long list of new names, and the money; a gentleman in Norwich, Conn. has been an active agent in our behalf; and to many more are we indebted for similar favors. We feel deeply gratified for these unsolicited favors, and they, together with a large number of most gratifying letters, testifying to the value of our journal, have shown us that there is a demand for such information as we have been giving, and that there are thousands of persons whom we cannot reach, who are yet ready to subscribe if they are asked to. Will not our friends throughout the country then take the trouble to show the Engineering News where they think it will be appreciated, and endeavor to help us in shortening up the period when we will be able to increase the size of our journal, and add to its appearance and its contents. One new subscriber a month added by each of our present list, would, by the close of this year, give us the largest *bona fide* circulation of any class journal in America, and by thus increasing our list, would give us an advertising patronage that would help us to place in their hands a periodical unsurpassed in genuine value by any similar one in this country. To each reader we would then say, send us at least *one* new name as soon as possible.

The Surveying Season.

The season for surveying in this vicinity commenced since our last issue. We do not know how favorably it compares with former seasons, in the other offices of the city, but we must acknowledge for ourselves that we are surprised at the number of large subdivisions that have been brought to our office, and which we have been obliged to decline, partly from want of time, and partly because the terms of payment for our services were not satisfactory. There is an unusual amount of buildings being constructed in Chicago this spring, on account of low prices of materials, labor, and money, and this has given the surveyors a fair average of business for this time of year. Real Estate is slowly but surely improving, but on account of the extremely disagreeable weather of the past month, the dealers have not had a fair opportunity of testing the market. It is encouraging, however, to see the confidence with which all parties owning land hold on, and continue to improve and prepare for future demand, their subdivisions. The backbone of the real estate traffic is, however, in the demand for cheap lots by workingmen, and until the active resumption of manufacturing industries, and the accumulation of surplus earnings by the mechanics, there will be but a very slow increase in the cash sales of land in any part of the country. When manufactures again become active, surveyors will find their services once more in brisk demand.

We will be obliged if engineers, surveyors, architects, manufacturers, real estate dealers, and others, to whose notice this paper may come, will send us for publication brief paragraphs relating to matters of local or general interest which may be occurring in their vicinity. We will thus be enabled to present our readers each month with an interesting record of what is transpiring throughout the country, and from which many valuable items of information may be obtained. We will endeavor to make this department hereafter an interesting feature in our paper.

Hints on Practical Surveying.

In the ordinary field practice of City Surveyors, especially of those new in the business, a considerable amount of time, labor, and money are expended, which with a little forethought might be saved.

First. Most of ordinary surveys, whether in the City or County are very much alike, and a few minutes of previous study in the office, of the problem to be solved, will save valuable time in the field. In many cases the Surveyor should be able to decide beforehand, not only on the point from which to start, but also just where the last stake is to be driven and consequently of all the intermediate movements, which from becoming thoroughly familiarized to the mind would each fall into its order and without delay. A well defined principle should always guide a surveyor in his practice. Otherwise he will, in his anxiety to save time and labor, be tempted to "experiment." He will start from some point or monument which appears to be rightly located and which if his measurements result satisfactorily he will adopt; but which oftentime only confuses him, and after a good deal of figuring has been done to reconcile matters and much time consumed, obliges him to commence where he ought to have done at first. It is a safe principle always to go to the point which is most likely to be established and from thence commence one's survey.

2nd The adoption of the foregoing principles of *previous study* and *working by plan*, while saving time, will necessarily save considerable labor, as each line is passed over the smallest possible number of times, necessary to define and mark it.

3rd In City work the only assistance necessary is one man—in staking out subdivisions, the addition of a stout active boy is necessary for rapid work—more assistants are very seldom needed except in timber and if they have to be retained under pay are not profitable. The first and most important lesson that a young Surveyor must learn is that he must *always* be at the *front*. He must do all the thinking, most of the walking, and a great deal of the downright hard drudging such as carrying and driving stakes, chopping, setting ranges, &c., &c., if he would make time and money. He should always "lead" in chaining and in cutting out a line will spend his time in keeping his axemen close to the line and always at work, rather than indulging in vociferous gesticulations behind his transit, and indolently awaiting the random and deliberate movements of untrained and uninterested assistants. The average Surveyor's assistant is not to be trusted in matters of measurement and judgment, and it is not until students have commenced practice for themselves that they take the necessary interest in their duties to ensure such uniform accuracy as to entitle them to be always relied upon.

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Public Works of Chicago.

[CONTINUED.]

THE SEWERS.

How shall the receptacle for the sewage be reached?

In most cities this can easily be done, by taking the shortest practicable line from each point to be drained, to the receptacle, through sewers that empty themselves by simple gravitation. In Chicago, however, the general level surface is so low, that a most careful and deliberate consideration is required in answering this question. During the last few years, much has been said and written, with regard to the proper forms and necessary declivity for sewers. The experience of European cities has been sought with great interest by those who have recently been called upon to devise systems of drainage for the cities of this country.

Some have contended that a declivity of one in two hundred was necessary to make ordinary sewers self-cleaning. This pre-supposes a great irregularity in the depth, and consequently in the velocity of the current, which irregularity is generally found to exist in practice. In fact it is so great, that we know of no city or town with a system of sewers so perfect throughout as not to require, occasionally, either flushing or cleansing in some of its parts.

If, then, provision must be made for cleansing the sewers but occasionally, it becomes a matter of great importance, financially, as well as practically, to know how much should be expended, and to what extent natural advantages should be sacrificed in order to obtain a nearer approximation, merely, to a self-cleansing system, before encountering the risks and uncertainties of a general system of deep sewers in a wet soil. Besides the danger of greatly increased cost of placing the sewers deep, especially if the season should be rainy, the masonry in such sewers after being laid, would be, to say the least, as liable to get out of order as that in those laid nearer the surface, and in all probability much more so, because of the danger of the greater head of water finding its way through imperfect joints, either in the masonry or pipes, and ultimately of undermining the sewers. When once injured, deep sewers, in such a soil would be much more expensive and troublesome to repair, and a corresponding increase of inconvenience and annoyance would be felt by those who should depend upon the constant action of them for the drainage of their premises.

It is sometimes urged against deep sewers, requiring machinery for pumping, that the engines are liable to get out of repair, but as there should be duplicate machines kept constantly in order, this objection has not much force, in time of peace and health.

In time of war, however, when such machinery would be liable to be destroyed, or in time of frightful pestilence, when men and means for making necessary repairs might not be at command, the dependence of a large city upon engines for pumping up its sewerage, might prove a terrible calamity. These are possible contingencies, and should therefore be considered.

It is known by actual experience, that a five feet sewer, with a declivity of only one in twenty thousand, filled half full with water, would have a current through it sufficiently rapid to move all substances that should be allowed to enter it from kitchens or water closets. Such a sewer filled to a uniform depth of six inches, with a declivity of one in twenty-five hundred, would have the same force of current. This is the greatest declivity it would be practicable to give to the main lines of sewers in Chicago, and at the same time have their outlets sufficiently high to discharge into the river, without the aid of mechanical power.

As in practice it might be impossible to keep out of sewers improper substances, provision must be made for cleansing them either by hand work, flushing, or giving them ample declivities, and as already mentioned the latter mode has not proved universally and perfectly effectual in any large town or city, so far as is now known. It would be impossible in this city to give to the sewers what is considered sufficient declivity to make them self-cleansing, without sinking them very low in some places and pumping up their contents. In view of the practical objections to those conditions, which objections will be more fully considered towards the close of this report; it is now proposed to dispense with pumping of the sewage, and to give the sewers such inclinations as the nature of the ground and the proposed modifications of the grades of the street will admit.

In order to keep the sewers free from offensive deposits, it is proposed to introduce a slight, but constant, current into the mains, from sources independent of the city water works, and to resort to flushing, or cleansing by hand, whenever necessary, either in branches or mains,

Both theory and practice show conclusively that the circular form of sewers, when not less than half filled, is the most efficient. When considerably less than half full, the egg-shaped sewer, modified in form so as to suit the depth is never maintained, and local circumstances must be carefully considered before a satisfactory decision with regard to the form can be arrived at.

In Chicago, two important circumstances bear with great weight on this subject.

The first is, the necessity of keeping the top of the sewers as low as possible, to avoid expense in raising the grades of the streets; and the second is, the desirableness of giving to them the utmost efficiency in proportion to their cost and sectional area for discharging their contents during, and immediately after, heavy storms. For the latter purpose, the circular form is undoubtedly the best, while the former would require an oval with the flat side down. Where there is only a slight depth of current passing through sewers, the egg-shape, small end down, would be more efficient than the circular form for large ones on the same sectional area. Under all these circumstances, it is thought best here to recommend the circular form as generally preferable, especially if bricks should be used in the construction of the sewers, and there is but little probability that, for most of them, any other material, procurable at the same cost, would answer so well.

In accordance with the foregoing views, a system of sewerage for this city has been devised and will now be described:

The sewers in the south district of the city have their principal dividing or summit lines; they discharge westwardly into the south branch between North and Washington streets, northwardly from Washington street, into the main river, between Market street and the Lake, and eastwardly into large mains on Michigan avenue, one of which empties into the river, and the other has its outlet into the lake, on Twelfth street; and, that small branch sewers run through the streets, which lie parallel with the summit lines, so that every lot may be reached.

In the north districts three main lines, extending from Division street to the main river, and having their outlets on Rush, Clark and Franklin streets respectively, are proposed; also a main, having its outlet into the north branch on Chicago avenue.

All the intermediate streets between the main and those running east and west, it is proposed to drain by branches of different sizes, so that every lot may be reached the same as in the south district. It will be observed that no sewer has its outlet into the lake in the north district.

In the west district mains from Reuben street to the south and north branches, are proposed. For the present it is recommended that they be constructed only in Prairie, Randolph, Monroe and Van Buren streets, and in these only so far as existing improvements may require them.

The streets and parts of streets intermediate between the mains, are to be drained by branches, and in the south and north districts.

It is recommended that the main sewers be circular, five feet in diameter, except the one through Clark street, in the north district, which, on account of its probable future extention northwardly, it is proposed to make six feet in diameter.

In a few places, especially in Michigan avenue, in the south-west corner of the west district, and wherever else mains must evidently terminate, they might diminish towards the upper ends to four and three feet in diameter.

The largest branches, it is proposed to make two feet, and the smallest fifteen and twelve inches in diameter. As already mentioned, the five feet sewers could have a declivity of two feet per mile. The two feet sewers not less than five feet, and the twelve and fifteen inch ones not less than ten feet per mile. The smallest sewers should enter the large ones with curved junctions, somewhat elevated above the bottom of the latter. The mains to be built eight inches thick, of brick, of the ordinary form, and in two rings or shells; the large branches of wedge-formed bricks, four inches thick. The smaller ones of earthen-ware glazed pipes, if they can be obtained in sufficient quantities of good manufacture.

For the purpose of supplying the mains with a constant current of fresh water, and also the means of flushing both them and the branches, it is proposed to lay lines of flushing pipes. These are to be four feet in diameter, and laid in North, State and Washington streets in the south district, Division street in the north district, and Reuben street in the west district.

In the south and north districts it is proposed to keep them filled, by pumping from the lake, to a height of eight or ten feet; and in the west district, by drawing directly from the canal at Bridgeport.

These flushing pipes are to be made of oak plank two inches thick, tongued and grooved, held together by iron hoops, and placed so low that the air would be always excluded from them, except when they might be intentionally emptied, either for inspection or repairs.

For the purpose of keeping the water in the south branch fresh, especially during the warm and dry season of the year, when there would be danger of sickness from putrid exhalations, it is proposed to construct a canal twenty feet wide and six feet deep at low water, between the lake and the south branch, through North street, and to protect its sides and bottom with oak timber and plank, and to cover its top with the same, so as not to interfere with the free use of the street.

By means of an eighty horse engine and a wheel, there could be driven through this canal four hundred cubic feet a second, or, in twenty-four hours, twenty four millions five hundred and sixty thousand (34,560,000) cubic feet, a quantity equal to all the water there now is in the river, between the lake and North street.

With such a supply of fresh water from the lake it would be impossible for the south branch to become dangerous to the health of the city, even with all the sewerage of its present and prospective population.

With regard to the outlets of the sewers, it is proposed to place them so that the bottom of the interior surface of the mains, would be six inches below the present surface of the lake, or eighteen inches above low water level of 1847; and to place the bottom of the two feet sewers, six inches higher, or above the level of the present surface of the lake.

As the lake, unaffected by winds, was, in 1838, twenty-four inches higher than the proposed outlets of two feet sewers, those would then be full and the five feet mains half full. This, if permanent, would be objectionable, as it would make it troublesome to cleanse out the smaller sewers especially; but, as the past general average level of the lake, according to the best information we can get, has been below that of the present season, about two-thirds of the time, it is believed that the benefit of having the outlets as low as now proposed, would, at mean and low water, be much more than an equivalent for the inconvenience of such an arrangement at high water.

It is proposed to receive the surface water, not only from lots, but streets, into the sewers, so long as the latter shall be capable of receiving it.

To prevent sand or other heavy substances, on the surfaces of the streets, from washing into the sewers, and thus clogging them, there is to be, at the corner of each block, a catch basin, similar to those used in New York, Boston, and Philadelphia. These must be emptied of their solid contents at intervals of time, depending very much upon the locality in which they are placed; in New York, some have to be emptied every three weeks, and some not once in three years. These are so constructed as to prevent offensive gasses from escaping into the streets.

For the purpose of having access to the sewers, either to flush, cleanse, examine or repair them, it is proposed to have entrances covered with manhole plates, at all the intersections of streets, and at intermediate points, where the blocks are more than four hundred feet long. These entrance places would serve as convenient points at which to place stop boards or valves for flushing purposes.

The smaller sewers should be provided, at intervals of about one hundred feet between the entrance places, with movable covers, about three feet long, so that in case of stoppage the sewer could be opened and cleansed without being broken. In order that every branch sewer may be supplied with flushing water whenever necessary, without depending upon the city water works, it is proposed to connect all the branch sewers together, at their summits, whenever the streets run in continuous lines, when, by means of stops or valves, it will be practicable to turn a stream of water in any direction.

In some portions of the city included within the territory it is now proposed to drain, more streets will have to be laid out, but it can be properly improved, and then only can the details of sewerage be judiciously arranged for such portions,

It is a question of great practical importance whether the branch sewers should be laid through the alleys or the streets. If alleys were systematically laid out through every block, for most purposes it would be better to lay the branch sewers through them; but where one block has an alley through it, and the next none, it would be necessary to lay a sewer in the street between. In such a case, to lay an additional sewer through the alley would be to the public a useless expense, although to individuals it might be very convenient. When the ordinary privy, with its cess-pool in the back yards is abolished, and water closets in the house are substituted, and the bottom of the cellar made high enough, a sewer in the main street would be preferable to one through the alley.

It would not be possible in the low streets, with the system now recommended, to have deep cellars, or any not liable to occasional flooding by backwater from the sewers, unless guarded by self-acting valves. The latter, however, is a difficulty from which no city, built on a comparatively flat site, is wholly exempt; and no system of sewerage providing at all for the surface water, could, without enormous expense, do away with it entirely. If, however, individuals should wish to have cellars as low as the sewers would drain them at ordinary times, they could protect them against the influx of back water of heavy storms, or when flushing might be resorted to, to cleanse the main or branch sewers, by the use of a simple valve, similar in construction to the one used in common pumps, and so efficient in the eastern cities, where cellars are often made with their bottoms several feet below high tide.

As all arrangements of this kind necessarily depend, for their efficiency, upon being faithfully kept in order, and upon all improper substances being excluded from the house drains, the city should in no wise be responsible for them.

The main sewers would not be large enough to receive the surface water in extraordinary storms, that is, when over an inch an hour should fall in summer, or a much less quantity when the ground is covered with melting snow. To obviate the difficulty that would be felt at such a time, and to prevent, as far as possible, collections of water from remaining in the streets, it is proposed to give to the latter, grates, inclining constantly, though irregularly, towards the river or its branches, or the lake; and to depend upon slight undulations in the gutters, to turn the surface water into the catch-basins at the corner of the block.

In order to make proper provision for receiving the surface water, it will be necessary ultimately to lay large main sewers through each street running east and west, in the west district, if the city should grow as rapidly as is expected. In that case the small branches now proposed would have to be taken up, but if the material in them should be wholly destroyed, the saving of the interest on the difference of first cost would, in five years, be more than sufficient to pay for them; but it is believed that the materials in them though liable to injure by being removed, need not be wholly lost. The value of five or more years of experience would be very important in determining, from the working of those first laid, what the sizes of the other mains should be; for it is impossible to tell, without actual experience, how much of surface water, in time of heavy storms, would find its way immediately into the sewers, and how much would be absorbed by the soil.

In order to give to the sewer a sufficient depth of earth over them, which should be nowhere less than two feet, it will be necessary to raise the grades of the streets above their present level an average of eighteen inches, for twenty-five hundred feet, westward from the river branches in the west district, a great part of which has already been provided for by the grades the city council has recently established.

In the extreme southwest part of the territory embraced in the plan, the ground is too low, by nearly four feet, to cover the proposed sewers to a sufficient depth; but the drainage of that part of the city might be taken southward into the river, instead of eastward, and a large portion of the filling saved; and as this part of the city may not be improved for several years to come, it is deemed sufficient for present purposes to state the general depth of filling that would be required by the system now proposed.

This low district has nearly a triangular shape, and extends as far north as Tyler street, and as far east as Halsted street, and the depth of filling required to raise the streets over it, would average about two feet.

So far as any new grades have been adopted for the south district, they are sufficiently high for the proposed sewers. South of Madison street, and north of the line of Tyler street, where no grades have been established, the streets should be raised an average of eighteen inches nearly for two thousand feet from the south branch. South of the line of Tyler street, this filling would extend but one thousand feet from the river, and be of the same average depth.

In the north district, between Division street and Chicago avenue, and extending from the proposed north branch canal to an average distance eastward of thirty-three hundred feet, there would be an average fill of eighteen inches. South of Chicago avenue and west of Dearborn street, the average depth of filling would be two feet. On Franklin street, where it is proposed to lay a main, it would average three feet.

If the streets should be raised much above the natural surface of the ground, it would be necessary to protect the yards and rear lots from being flooded by back water from the street sewers in very heavy storms, by a valve arrangement similar to the one necessary for cellars, provided a temporary flood would at such a time be considered a serious injury.

The main sewers nearest and parallel with the lake in the south and north districts, could easily be relieved of excessive storm water, by waste wiers placed about three feet above their bottoms, and discharging into lateral conduits conducted by the shortest possible lines with the lake.

For the main and larger sewers, the best material, as already mentioned, is believed to be brick. The two-feet branche sewers should have glazed bottoms to the height of three inches. This mode of building sewers has been practiced in England, and no doubt could be carried out here. For the small ones, whenever fifteen inches or less in diameter may be used, earthenware glazed pipes would be preferable, if they could be obtained at a cost not over fifty per cent. higher than they are made for in England.

A successful manufacture of these pipes would be of immense importance to this city, as great numbers of them must be used, especially for house drainage; and there does not appear to be any good reason why such a manufacture should not be established.

In consequence of the impossibility of determining at this time the cost of different kinds of materials, the estimates will be based upon the ruling prices of the past season for bricks, and upon what the makers of pipes in other places offer to furnish them at. It is proposed to build into the main and brick sewers, junctions for every house and every lot likely to be occupied by a house, or to need draining, to avoid the necessity of breaking the masonry whenever permission to enter the sewers may be asked.

The foregoing description should be considered as giving but the general features of the plan, and not the details.

Further information may show the propriety of modifying either the location or sizes of some of the mains, branches, and flushing pipes.

Brevities.

The United States Military Reservation in the Island of Mackinaw, except the fort and its more immediate surroundings, has been dedicated to the purposes of a National Public Park. Mackinaw Island is already a favorite summer resort, and this removal of certain restrictions that have heretofore been placed upon the movements of visitors, will have a tendency to greatly enhance its well deserved popularity.

In 1823 the residents of Chicago depended for their supplies of provisions on Mackinaw and St. Louis. A garrison of eighty men could not, by unremitting industry, raise enough to supply its own wants.

Evanston, perhaps the principal suburb of Chicago, is rapidly assuming all the functions of a city government. It now has Standing Committees on Finances and Standing Claims; Water Works; Streets, Alleys, and Cross-Walks; Street Lamps; Special Assessments and Taxes; Police and Fire Department; Sewerage and Drainage; Judiciary, Plats, and Subdivisions.

On May 1st the Pennsylvania Railroad Company declared a semi-annual dividend of 4 per cent.

The original land grant of the Flint and Pere Marquette Railroad was 511,992 acres, of which there are still unsold 262,885 acres. During the past year 8,214 acres were sold for $89,502, and the total amount realized to Jan'y 1, 1875, was $2,108,610.59, or about $8.00 per acre.

The contractors have commenced building the first section of the Gulf, Colorado & Santa Fe Railroad, turning up the first dirt at the crossing of Mechanics and Thirty-ninth streets, Galveston.

In reply to J. N., on page 58, as to whether we "intend publishing all the *different* solutions sent," we will say that we propose to do so as far as our space will allow. His solution for the April number was received and sent to the printers for insertion, but was overlooked until too late, and we regret to say has been mislaid. If J. N. will send us a duplicate we will take care that it appears in our June issue. We are very much obliged to him for his interest in our paper, and shall try to retain it.—Ed.

Astronomical Notes.

PREPARED FOR THE ENGINEERING NEWS BY S. W. BURNHAM, F. R. A. S.

The report of work done by the English Observatories, during the past year is encouraging. The observation of Argelander's stars between 25° and 30° North Declination for the new catalogue of stars in preparation by the German Astronomical Society, was assigned to the Cambridge Observatory, and about 5000 observations have been made. The Temple Observatory, Rugby School, has been chiefly engaged in the measurement of double stars. Mr. Barclay's observatory, which is furnished with a fine 10-inch refractor by Cooke, is also almost exclusively engaged in the same work, and the annual volumes form valuable contributions to knowledge on this subject. Most of the stars observed are well recognised binaries from the Dorpat Catalogue, but not many of them sufficiently difficult to tax the powers of so large an instrument. About 400 double stars have also been measured during the year at Mr. Crossley's Observatory, near Halifax, with a 9½-inch refractor, by the same maker, and in addition a large number of observations of the phenomena of Jupiter's satellites recorded by Col. Tomline's observatory at Ipswich, has been put in complete working order, with an excellent 10-inch Merz refractor, and is under the charge of Mr. Plummer. The special work will be the observations of Comets, a subject to which Mr. Plummer has given particular attention.

The identity of the double stars $\Sigma 3,112$ and $O\Sigma 528$, heretofore regarded as distinct pairs, is shown by an American observer in No. 2,033 of the *Astronomische Nachrichten*. These stars are entered respectively in the great Dorpat Catalogue by the elder Struve, and in the Pulkowa catalogue by Otto Struve, the present director of the Imperial Observatory of Russia. Measures by Demboski in 1869, show that no change have occurred since the first observation. The same paper has a note with reference to $O\Sigma 460$ which appears to be triple, with perhaps a fourth member.

Argelander, one of the most distinguished of modern astronomers, died at Bonn last February in the 76th year of his age. To few men are we more indebted for our knowledge of the sidereal heavens. His first work attracting public attention, was the investigation of the orbit of the comet of 1811. Shortly after he commenced his researches into the proper motion of the stars, and of our own sun through space, and contributed to the solution of these difficult questions. The catalogues of stars made by him, and under his supervision, contain more than 300,000 stars visible in this latitude, and so complete down to the ninth magnitude that it is very seldom an omission is detected. Even a brief mention of the numerous important works of Argelander would require considerable space. For more than half a century he has been one of the most dilligent workers, and the results achieved are commensurate with the genius and perseverance of the man.

Prof. Langley, of the Allegheny Observatory, has undertaken the investigation of the relative temperatures of different parts of the surface of the sun, and finds, as has been previously supposed, that the nucleous of a spot radiates less heat than the neighboring surface. A 13-inch refractor was used, the image of the sun being enlarged to a circle of two feet in diameter, and a very delicate thermopile placed in different parts of the image. This was connected with a mirror-galvanometer which showed by the emotion of a spot of light from a mirror carried by the needle, a very slight difference of temperature between the two faces of the thermopile. While it was found that the nucleus of a spot was much cooler than the surrounding surface, there was no great difference between it and the photosphere near the sun's limb, though the difference in brightness is very great. Taking Herschel's estimate of the brightness of the nucleus, Prof. Langley finds that we receive from a spot fifty times as much heat as light; and a similar conclusion is arrived at with reference to the surface near the limb, though the disproportion is not so great.

Prof. Galle, of the observatory of Breslau, gives in the *Astronomische Nachrichten* his final results with reference to the parallax of the sun from observations of the minor planet Flora about the opposition of 1873, when the planet was near perihelion. For this purpose, observations were made, among other places, at Washington and Clinton, in this country, and at Moscow, Cape of Good Hope, Dublin, Melbourne, Upsala, and other points. From the observations of 37 northern and 36 southern stars, he computes a parallax of 8″.879. This is the exact result obtained by d'Abbadie from the work of the French astronomers on the transit of Venus.

Mr. Tebbut, of the New South Wales Observatory, calls attention to a new variable star, B. A. C. 2695. In this as well as the Paramatta catalogue, it is rated sixth magnitude, while in Taylor it is entered as the tenth magnitude. Last August Mr. Tebbut was unable to see it with a telescope of 4½-in. aperture, from which it would appear to vary from sixth magnitude to invisibility. Every year increases the number of these strange objects, and of many the periods have been pretty accurately ascertained, but almost nothing is known of the cause of such changes.

Prof. Schiellerup, of Copenhagen, has published in the "Vierteljahrsschrift der Astronomischen Gesellschaft," (1874) a revised and extended catalogue of Red Stars. His previous list has been the only collection hitherto made, but at the present time is very imperfect by reason of many stars being omitted, and the discovery of a considerable number during the last years. The revised edition contains more than 400 stars with their catalogue places for 1865, together with the magnitudes, remarks as to color, and other information. In many instances these red stars have been found to be variable, and when known, the periods are given. The only omissions of red stars noticeable are several of Sir John Herschel's double stars, some of which are described by him as "deep red" and "very beautiful."

The English observers of the solar eclipse at Siam, April 15th, were partially successful, and obtained a number of good photographs at Bangkok. A telegram to the *Daily News* says, "The results of the expedition must be considered merely preliminary, this being the first time spectrum photography has been tried. The prismatic camera shows the rings with protuberances at the edge of the sun, and at least one more ring towards the ultro-violet without protuberances. Eight good photographs of the corona were taken, the exposure varying from two to sixteen seconds."

We learn from *Nature* that the 14-inch refractor of the Paris Observatory which was damaged during the late war, as well as the dome which was pierced by hundreds of bullets, are being put in order for regular work. The telescope will be exclusively devoted to celestial photography.

Popular Science Notes.

Strength of iron and chains. The rule for breaking weight of ropes is: Multiply the circumference in inches squared by 1.5 for iron wire ropes; and by 2.5 for steel wire. Strength of chains. To find the breaking weight: Divide the square of the diameter of one bar of the link in sixteenths of an inch by 9 for short link chains, and by 8 for studded chains. The strain on a chain should not exceed one-sixth the ultimate strength.

An iron ship 300 ft. long is about 1 in. longer when in the Gulf stream than in the Northern seas, with the water at a temperature of about 35°, the difference being due to the expansion of the iron in the warmer current.

To keep the nuts of fishbolts tight paint the thread with white paint.

Insulated magnetised steel rods having sharp points along their length and suspended in the steam chamber of boilers is said to prevent scale.

BURNING OF COTTON MILLS.—Cotton mills have been burned by fire originating in the attrition of stones contained in the cotton, in their passage through the scutching machinery.

Landscape Gardening.

All rational improvement of grounds is, necessarily, founded on a due attention to the *character* and *situation* of the place to be improved: tne *former* teaches what is advisible, the *latter* what is *possible*, to be done; while the extent of the premises has less influence than is generally imagined; as, however large or small it may be, one of the fundamental principles of landscape gardening is to disguise the real boundary

In deciding on the *character* of any place, some attention must be given to its situation with respect to other places; to the natural shape of the ground on which the house is, or may be, built; to the size and style of the house, and even to the rank of its possessor; together with the use which he intends to make of it, whether as a mansion or a constant residence, a sporting seat or a villa; which particular objects require distinct and opposite treatment.

However delightful a romantic or mountainous country may appear to a traveler, the more solid advantages of a flat one to live in, are universally allowed; and in such a country, if the gentle swell of the ground occasionally presents the eye with hanging woods, dipping their foliage in an expanse of silvery lake, or softly gliding river, we no longer ask for the abrupt precipice or foaming cataract,

Where the ground naturally presents very little inequality of surface, a great appearance of extent is rather disgusting than pleasing, and little advantage is gained by attempts to let in distant objects; yet there is such definite beauty to be produced by judicious management of the home scenery, as may well compensate the want of prospect. There is always great cheerfulness in a view on a flat lawn, well stocked with cattle, if it be properly bounded by a wood

at a distance, neither too far off to lessen its importance, nor too near to act as a confinement to the scene; and which contributes also to break those straight lines that are the only causes of disgust in a flat situation. Uneven ground may be more striking as a picture, and more interesting to the stranger's eye, it may be more bold, or magnificent, or romantic but the *character of cheerfulness* is peculiar to the plain. Whether this effect be produced by the apparent ease of communication, or by the larger proportion of sky which enters into the landscape, or by the different manner in which cattle form themselves into groups on a plain, or on a sloping bank, I confess I am at a loss to decide: all three causes may; perhaps, contribute to produce that degree of cheerfulness which every one must have observed in the scenery of Milton.

In former days, the dignity of a house was supposed to increase in proportion to the quantity of walls and buildings with which it was surrounded: to these were sometimes added tall ranks of trees, whose shade contributed to the gloom at that time held essential to magnificence.

Modern taste has discovered, that greatness and cheerfulness are not incompatible; it has thrown down the ancient palisade and lofty walls, because it is aware that liberty is the true portal of happiness yet, while it encourages more cheerful freedom, it must not lay aside becoming dignity.

The perfection of *Landscape Gardening* consists in the four following requisites: First, it must display the natural beauties, and hide the natural defects of every situation. Secondly, it should give the appearance of extent and freedom, by carefully disguising or hiding the boundary. Thirdly, it must studiously conceal every interference of art, however expensive, by which the scenery is improved; making the whole appear the production of nature only; and, fourthly, all objects of mere convenience of comfort, if incapable of being made ornamental, or of becoming proper parts of the general scenery, must be removed or concealed.

From the prodigious difference of taste in gardening betwixt the last and the present century, it seems, at first sight, almost impossible to lay down any fixed principles; but, on duly considering the subject, it will be found that in this instance, as well as in many others, mankind are apt to fly from one extreme to the other; thus, because straight lines, and highly finished and correspondent parts prevailed in the ancient style, some modern improvers have mistaken crookedness for the line of beauty, and slovenly carelessness for natural ease; they call every species of regularity formal, and, with the hackneyed assertion, that "*nature abhors a straight line*," they fatigue the eye with continual curvatures,—REPTON.

"SCOTT'S BOULEVARD ADDITION TO CHICAGO."—This so-called subdivision is in the town of Worth, in this county, or technically, it is the N. W. ¼, S. W. ¼, 19, 37, 13. Further, Gen. Lieb, County Clerk, testifies as follows concerning its location and natural advantages, and the size and value of the lots:

It lies nearly 14 miles in a direct line from the Court House, and nearly 6 miles from Washington Heights, and is also 6 miles from any railway; there are 200 acres, cut up into twenty-one subdivisions; twenty of the subdivisions, covering 160 acres of ground, are divided into 672 lots each; or 13,410 lots in all; there are 140 blocks in the 160 acres, with streets and alleys between and through each; the lots average about 23 feet square, and contain on the average 511½ square feet,—making no allowances for the streets or alleys that are shown on record; the lots in these 160 acres lie under 2 feet of water, and successful drainage can never be accomplished; the inhabitants in the vicinity are composed mostly of bull frogs and mud turtles; the value of such property is entirely imaginary.

There are three other subdivisions of the same character as to size in the same town, and four in the town of Thornton, lying southeast of Worth, which Gen. Leib looks on with disfavor. The latter three are named Park Ridge, Phillips', and Canaansport. It is enough to say of them all that, in Park Ridge, the lots are, by survey, 13⅓ by 41 feet, the streets 10 feet, and the alleys 5 feet.

It costs the tax payers of Cook County over $20,000 per annun to keep the records and assess the taxes of the "bogus" subdivisions in the county.

NEW PUBLICATIONS.

TREATISE ON THE RESISTANCE OF MATERIALS by De Volson Wood, Professor of Mathematics and Mechanics in Stevens Institute of Technology. Wiley & Son. New York. 1875.

This work, which is a standard authority upon the subject of which it treats has lately been thoroughly revised by its author who has added much new experimental matter, and considered in the most judicious manner the latest developments of theory. The work is already largely used as a text-book in the leading technical schools of the country, and this new edition adds greatly to its value, and will undoubtedly cause it to be indispensable to the library of every engineer. The typographical work is much better than in the former edition and is creditable to its publishers.

CORRESPONDENCE.

MR. EDITOR,

Where should the 1-8 post be placed on the town line on the west side of the N.W. ¼ of Sec. 6, the reported length being 43.19 the actual length 40.00; to divide proportionally gives the South part 18.523 chs., North part 21.477 chs?

A prominent surveyor in this region denies the propriety of dividing proportionally on closing lines, especially North and West randoms. He claims that the law requires an even 20 chains to each 40 acres, except the last, which must stand the excess or deficit. Now can any considerations suffice to prevent that half mile being divided proportionally, thus, 18.52 3-10, 21.477-10. J. B., Lancaster Wis.

ANS.—You must divide proportionally.

MR. EDITOR:

The solution to the problem in the March number is not correct. The horse does not travel on a spiral path, but on the *involute* to the circular post. W. A T. says that the distance around the first time is obtained by calculating the circumference of a circle of 99½ yards radius. This is certainly not self evident and needs demonstration.

If we take s for the length of the path described by the horse, n the number of times around the post, and a the radius of the post, then by the solution I sent you we have $s=n^2\ 2\ a\ \pi^2-n^2\times 2\ a\ \pi\times\pi$, but $2\ a\ \pi$—one yard, therefore we have for the true result in this case $s-n^2\ \pi$, taking the more extended value of π—3.1415926 gives distance traveled 3145.926 yds.

W. A. T. 3146.980 "

Error of solution, 1.054 yds.

Suppose the post to be 200 feet in circumference, the horse having now wound the cord up, we will inquire what distance the horse will travel in winding of the first and second halves of one round. For the first half we have $n=½$, and $2\ a\ \pi$—200 ft., therefore $s=¼\times 200\times\pi=157.08$ inch. For one turn $n=1$ and $s=200\times\pi=628.32$ nearly, hence 628.32—157.08—471.24—last half.

The method of your correspondent would give in this case 314.16 for each branch.

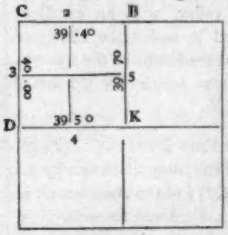
Let us know in the next numbe- whether you intend publishing all the *different* solutions sent, so that we can form some judgment whether it will pay.

J. N.

MR. EDITOR,

I submit the following question:

In the annexed diagram of Section 6, suppose,—



1st, that the measured length of the section lines correspond with the Gov. field notes as noted on the plat, how far from the adjacent corners should the quarter quarter corners, at 2, 3, 4 and 5 be placed? supposing the measured distance on the ¼ line from K to D to be 39.50 and from K to B to be 39.70.

2nd. Supposing the actual measurement on the section lines to either overrun, or fall short of the Government measure, what should be done?

3rd. Supposing the whole N. W. ¼ to be owned by A, who deeds to B the "N. W. ¼ of the N. W. ¼" without the usual words "according to Government survey," or any other qualifications or explanations whatever, is B entitled to an equal division of the quarter, the same as if it was not fractional, or only in accordance with Government survey?

Let us see, Mr. Editor, how many surveyors have a decided opinion on these questions, and how many will agree in all material points. T. H.

ERRATUM.—The Center of a section.

SHAWANO, WIS., May 1, 1875.

MR. EDITOR:—Please correct the third paragraph of my communication on page 47 so as to read as follows: "therefore it is plain that it has *no* reference to the establishment of the *center quarter corner of a section but has especial reference to the establishment of the* north half section or north quarter section corners (synonymous terms) of the north tier of sections upon township lines or cases where there are *double* corners."

J. M., Co. Surveyor.

DES MOINES, IOWA.

MR. EDITOR:—Please correct the following in the Table of Ordinates, &c.

In column 100 for 63.64 read 62.63.

NOTE. 1. $.6682h$ should be $.9682h$

$x=\ ½(c^2+h)$ should be $½\left(\frac{c^2}{h}+h\right)$

$\frac{(20)^2}{1.25}+1.25=160.625$ shoud be $½\left[\frac{(20)^2+}{1.25}+1.25\right]$

$.0002\times 160.165$ should be $.0002\times 160.625$

$.0008\times 160.165$ should be $.0008\times 150.625=.1285$

B. C., City Engineer.

Extracts from Correspondence.

ON THE "DUE NORTH COURSE."

"It is very easy to see that under the present system of Government surveying, it is impossible to lay out townships and sections in exact squares, having all the lines due east, west, north and south.

The Government has said that the surveys made under its instructions and returned by the Surveyor General shall be considered correct, and the corners so marked shall be considered the true corners. Now if we are bound to call the Govt. lines north, south, east, and west, I think we are equally bound to call parallel lines, or intermediate lines by the same names."

What is due East, West, North, and South? and how do we know when we make such a line? When we talk about due courses do we mean true meridians, or do we mean courses corresponding with lines established by the Government and called due courses?

We can by astronomical observations, establish true meridians, which we may call due courses and at the same time we may differ in that case very much from our neighbor who attempts to do the very same thing. If the U. S. Topographical Engineers are not satisfied with a meridian line, or line of latitude or longitude, until they have made several hundred observations at the same station, with several different instruments of the very best quality obtainable, and then take a mean average of the whole, I think it would appear very presumptious for the ordinary county surveyor, with perhaps an ordinary compass, which is a coarse instrument and unreliable at any time, to say as some have done, "I have simply run those lines according to the plain letter of the law, due E., W., N., or S., as the case may have been."

I am surprised at the extremely literal view of Messrs. Wilson, Hawes, and Barney, of that law of Congress of February 11, 1805. They talk as though a *due course* is a thing to be picked up at any time in a few minutes by almost any man who can carry a compass, and as for such due courses as our Michigan Government surveyors made in some cases in this state, it would not make much difference whether he had a compass or not; then again all surveying instruments even of the best quality, do not agree, and to put the purchaser of a piece of land to the expense of having a true meridian established on his land before it can be surveyed is simply preposterous. W. L. C., Grand Rapids, Mich.

We consider the subjects of "Due North" courses, finding the centre of the section, and the subdivision of fractional sections, as having had their full share of attention. We hope the discussion has confirmed any doubts in the minds of surveyors as to the correct solutions of these problems, and we trust that even a small gain in uniformity of practice may result therefrom. But until after Congressional action has been taken on these subjects, and they have been decided upon by the highest courts in the land, there will be constant differences of opinions and troublesome and expensive litigation will continue.—ED.

Stadia Measurement.

CAMPINAS, PROVINCIA DA SAO PAULO, BRAZIL.
March 12th, 1875.

EDITOR OF ENGINEERING NEWS.

I am glad to see that the attention of the profession is being called to the system of Stadia Measurement. I used it on the Texas & Pacific Railway in '72 and '73, in running out the land lines for the company, and I found it very expeditious and accurate. I used a common plain transit whose object glass had a focal length of 5.54 inches, and the two cross-wires were 0.072 inch apart. The distance from the centre of the instrument to the optical centre in front of the object glass, was found=11.95 inches at the normal focus, i. e. focus=∞, as the telescope focussed upon a distant object. I used a plain white pine rod 1×2½ inches, with two targets. The graduation was effected by measuring a level base line 501 feet long; one target was made fast about 15 inches from the ground and was called zero, the other placed in the line of the sight so that each wire covered the centre of the target. Several readings were taken and the mean distance was found between the targets to be equal 64.98 inches; this was divided into 500 equal parts, and also continued upon the rod until the whole length was graduated. The targets were square 3½×3½×⅝in. covered with drawing paper painted in the alternate squares with carmine, and varnished with shellac. The cross wire was set upon one of the targets and brought accurately into line by tapping the telescope with the finger nail; with a little practice it is as expeditious as to have a tangent screw. The rodman took his station, and if it was found much over 500 feet the rod was inverted and the target was thus easily placed in position. For correcting the distances when the ground was sloping, I estimated the difference of level, or rather the angle of slope, and made the correction by "eye." On one occasion I ran out a square tract of land 2000 feet on the side, in a heaving pinery, and closed with an error of 1 foot of one northing and one easting. I was much bothered at first about the difference between the results given by the instrument and the tape, when the distance was small, say under 100 feet; I had assumed that the space covered upon the rod was proportional to the distance from the centre of the instrument, instead of a distance in front of the instrument, equal to the distance from the centre of the inst.+the focal length of the object glass. I am indebted for the correct solution to Professor L. W. Robinson, of Champagne Industrial College, Ill., also to Professor De Volson Wood.

For the exact correction of the results, when the ground is sloping, the distance upon the slope, or rather the length of the line as found, should be multiplied by the square of the cosine of the angle of slope; in practice, it is better to use a diagram to reduce by inspection, which I did as follows:—take a sheet of cross section paper 3×6 inches, rule in 1-10ths, set off horizontally on the bottom, a scale of distances running from 0 to 500; on the right hand vertical line over 500, set off the difference between 500 and the product of cosine^2×500 for 1°, 2°, 3°, etc.; through these points and the zero, draw straight lines, then will the vertical scale show the exact amount to be subtracted from the observed distance. I think one in one thousand is about as close as can be expected with a six inch object glass. It is also necessary to focus exactly to secure good results; this could be affected better if there was a scale upon the telescope showing its exact position for any given distance; thus for example: a sight was taken and found say equal 500 feet, then look at the scale as shown by the object glass tube, and if not equal 500 make it 50, this arrangement would secure perfect accuracy as well as afford and approximate method of measuring distances when no great accuracy is required as by the simple focussing the distance would be known with much greater certainty than it could be guessed. Hoping these notes may be of use to the profession and that the ENGINEERING NEWS will be liberally supported, I remain,

Yours respectfully, L. W., C. E.

Practical Mathematics.

PLANE TRIGONOMETRY.

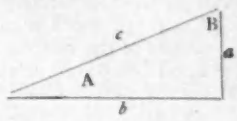
RELATIONS BETWEEN THE SIDES AND ANGLES.—The relations which exist between the sides of a right-angled triangle, the hypothenuse, and the angles adjacent to the hypothenuse, are contained in the following propositions.

RULE I.

In a right-angled triangle, either side is equal to hypothenuse, multiplied by the sine of the opposite, or cosine of adjacent, angle.

$$a = c \sin A\,;\ b = c \cos A,$$
$$a = c \cos B\,;\ b = c \sin B.$$

CONSTRUCTION.—Let a right-angled triangle be constructed as in the following figure.



RULE II.

In a right-angled triangle, either side is equa to the other multiplied by the tangent of the opposite, or cotangent of adjacent, angle.

$$a = b \tan A\,;\ b = a \cot A,$$
$$a = b \cot B\,;\ b = a \tan B.$$

OBLIQUE ANGLED TRIANGLES.

RULE I.

Any two sides of a plane triangle are in the same ratio as the sines of the opposite angles.

STATEMENT.—Let the two sides be a and b, and the opposite angles A and B, then

$$a : b :: \sin A : \sin B.$$

RULE II.

In a plane triangle, the sum of the sides is to their difference in the same ratio as the tangent of half the sum of the base angles is to the tangent of half their difference,

$$a+b : a-b :: \tan \tfrac{1}{2}(A+B) : \tan \tfrac{1}{2}(A-B).$$

RULE III.

In a plane triangle the base is to the sum of the sides in the ratio as the cosine of half the sum of the base of the angles is to the cosine of half their difference: also

The base is to the difference of the sides in the same ratio as the sine of half the sum of the base angles is to the sine of half their difference.

STATEMENT.—Let the sides and base of the triangle be a, b, and c, and the angles respectively opposite A, B, C, then

$$c : a+b :: \cos \tfrac{1}{2}(A+B) : \cos \tfrac{1}{2}(A-B)$$
$$c : a-b :: \sin \tfrac{1}{2}(A+B) : \sin \tfrac{1}{2}(A-B).$$

RULE IV.

The square of a side of a plane triangle which is opposite an acute or obtuse angle, is equal to the sum of the squares of the sides which contain the angle, less by twice the rectangle under them, into the cosine of the angle.

STATEMENT.—Let the sides of the triangle be a, b, and c, and the opposite angles A, B, and C, then

$$a^2 = b^2 + c^2 - 2bc \cos A$$
$$b^2 = c^2 + a^2 - 2ca \cos B$$
$$c^2 = a^2 + b^2 - 2ab \cos C.$$

PROPOSITION V.

The area of a plane triangle is equal to half the rectangle under any two sides into the sine of the included angle.

STATEMENT.—Let the sides be b and c, and the included angle A, then

$$\text{Area} = \tfrac{1}{2} bc \sin A.$$
$$= \sqrt{s(s-a)(s-b)(s-c)}$$
$$\text{Area} = \sqrt{s(s-a)\,(s-b)\,(s-c)}$$

From this expression we derive the following rule for computing the area of a triangle when the three sides are given.

RULE.

1°. Add the three sides of the triangle together, and take half the sum.

2°. From the half sum, subtract each side separately.

3°. Multiply together the half sum and the three remainders.

4°. Extract the square root of the product.

The result is the area of the triangle.

The Pittsburgh Manufacturing Company's works are running lively with increasing demand for their products.

Law and Legislation.

An abstract of decisions of the Supreme Court of the United States and of the courts of the various States in the Union upon questions relating to boundaries, surveys, etc. Compiled for the ENGINEERING NEWS by John Dunn, Esq., Attorney at law.

255. Where boundary descriptions in a deed of land disagree, and one is described as certain, and the other uncertain, the former must prevail in absence of controlling circumstances. Ricker v. Barry, 34 Maine, 116.

256. Evidence of the direction of an undisputed line between town lots is admissible to show probable direction of a disputed line between adjacent lots. Gibson v. Poor, 1 Foster (N. H.), 440.

257. To establish a disputed line between town lots, an ancient plan was offered in evidence, purporting to have been made by one A, but without date. It appeared that said A had been many years previously appointed to survey the town, that the plan had been more than thirty years before the trial among the town records, and was produced from the possession of one who was then town clerk, but whose faculties had become so impaired that no account could be given of the kind or manner of its being taken from among the records. Held, that the plan and the evidence concerning were admissible. —IBID.

258. The declaration of a former owner of land made during his occupation of it, and who has since conveyed it by deed, that a certain corner was one of the corners of his land, is competent evidence in a suit against a subsequent owner of the premises, in which the boundary of the land is in controversy, although it may tend to show that the land is less in quantity than that described in the deed. Hobbs v. Cram, 2 Foster (N. H.), 130.

259. A boundary line, run out and established by a surveyor, in pursuance of an agreement of the parties, is conclusive upon him. IBID.

260. The declaration of a deceased person, made on the spot, is competent evidence to prove an ancient boundary, when the person making the declaration had the means of knowledge, and no interest to misrepresent. Melvin v. Marshall, 2 Foster (N.H.), 379.

261. Certain Indians, in a grant of land, made a reservation of a tract, bounded north on a line some miles in length, "running a due west course" from a given point. In a controversy, arising more than a hundred years after, between parties owning land on different sides of the Indian line, it was held that evidence of general tradition or reputation, and of the understanding and occupation of the owners of land bounding on the line, and of deeds made by them, and acts of the legislature, referring to the line, would warrnt the jury in iuferring that a line, varying some degrees from a due west course, was located, laid out, and assented to and adopted by the parties; and that, if the jury did so find, the line to establish must be taken to be the true Indian line. Kellogg v. Smith, 7 Cush. (Mass.), 375.

262. A conveyed land to B, describing it as bounded "north on the line of Blandford." The line of the town of Blandford was subsequently established by the Act of the Legislature; after which B conveyed to C by a similar description. Held that the line so established was the northern boundary of the land included in the deed from B to C, and that parol evidence was inadmissible to show that, prior to this Act of the Legislature, the line of Blandford was understood aud reputed to be farther north than the line so established, and was defined by a line of marked trees, and that the deed from B to C was intended and understood by the parties to convey the same land included in the deed from A to B. Cook v. Babcock, 7 Cush. (Map), 526.

263. In ascertaining the boundaries of a grant, when a point is described, as being a given distance from a certain other point, a direct line is implied, unless there be something to rebut the implication; and the circumstance that both points are on the same river, has no tendency to destroy the implication. Slade v. Etheridge, 13 Ired. (N. C.), 353.

264. What are the boundaries of a tract of land is a mere question of construction, and for the court, but where a line is, and what are the facts, must be found by a jury. Burnett v. Thompson, 13 Iredell (N. C.), 379.

265. In the absence of satisfactory proof of marked lines and corners, the plat and certificate of survey accompanying the grant, will be evidence of the locality of the land granted. Tate v. Gray, 1 Swan (Tenn.), 73.

266. When the boundaries of land are indefinite and uncertain, if run out and marked by the owner, it will be presumed, as against him, that it was correctly done; this presumption, however, may be removed by proof of a mistake, and that the lines as marked, vary materially from the true lines. Cunningham v. Roberson, 1 Swan (Tenn.), 138.

267. The original descriptions of the subdivisions of the public lands, made by the Surveyor-General from the field notes or books of the Deputy Surveyor, and the plats showing such subdivisions, are evidence as to their boundaries; and duly authenticated copies of such descriptions and plats are also evidence. Madison City v. Hildreth, 2 Carter (Ind.), 274.

268. It is doubted whether the original field notes of the Deputy Surveyors are evidence as to boundaries; but if they are, they must be controlled by the descriptions and plats made by the Surveyor-General. —IBID.

269. A grant of land bounded by a stream, carries with it the bed of the stream to the centre, unless a contrary intention is clearly manifest from the conveyance itself. Morris v. Hill, 1 Mann. (Mich.), 202.

WE hear of some competitive tests between English and American steel, that are being made by some Eastern hardware manufacturers, that have thus far resulted very favorably to the home product. When quality is the only question the result is not uncertain, but the opposition of prejudiced or interested overseers, and other persons of influence in the works, is the main difficulty to overcome.

THE trustees of the Cincinnati Southern Railroad have awarded the contract for constructing the railroad bridge over the Kentucky river, to the Baltimore Bridge Co., at the bid of $377,500. The bridge is to be 273ft. high and 1200ft. long. The Keystone Bridge Co., of this city, put in a bid at $409,800.

Real Estate.

CONVEYANCING.—A great deal of useless and vexations litigation might be avoided if parties, before making out a conveyance of land, would submit the description of the property to be conveyed to a competent Surveyor. There are matters of measurement in comection with the division of the ordinary section that it seems impossible for any but practical surveyors to fully understand, and which are neglected almost universally by conveyancers, and thus become sources of future litigation and needless expense. Lawyers and real estate dealers are not the proper persons to describe the legal boundaries of land any more than a chemist is the one to prescribe the medicines he is to mix.

The number of a lot and of the block it is in, together with the name or title of the subdivision, are all that should go in a conveyance; to add a description of the lot by "metes and bounds" is not only unecessary, but often actually mischievous.

A *chain* is 100 links or 66 feet in length, and in multiplying or dividing chains and links the same system of notation is used as in that of dollars and cents. There are 100,000 square links in one acre, so that to know how many acres are in any piece of land, having found the area in square links, "point off" the five right hand figures and the remaining left hand figures denote the acres, and the part cut off denotes the fraction of an acre. If the area has been reduced to square feet divide the amount by 43560 which represents the number of square feet in one acre.

SOLAR PARALLAX. — The methods which serve in astronomy to determine the parallax of the sun can be classed into three groups:—

1. *Physical methods*, founded on observation of an optical phenomenon; they comprise the observation of the eclipses of Jupiter's satellites, or the aberration of the fixed stars, combined with the value for the velocity of light deduced without the intervention of other astronomical phenomena; the results of these methods are $\epsilon = 8''{\cdot}88$, $8''{\cdot}88$. $8''{\cdot}80$. Mean $8''{\cdot}85$.

2. *Analytical methods*, which depend on the comparison of astronomical observations with theoretical laws founded on the principal of universal gravitation: they give, values near $8''{\cdot}86$.

3. *Purely geometrical methods*, depending on the parallactic displacements of the planets near the earth: the oppositions of Mars furnished, in 1862, $\epsilon = 8''{\cdot}84$. But the transit of Venus across the sun is the phenomenon in which the geometrical method can attain the greatest precision. —*Nature.*

Good manufacturing sites in Pittsburgh close within the city limits have not felt the panic in proportion as other values have.